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ABSTRACT

This study incorporated classroom observations and taped interviews designed to reveal what each teacher believed about such matters as the nature of science and knowledge, the nature and purpose of education in general and science education in particular, and basic beliefs regarding God and purpose in life. Classroom practices of the subjects--two secondary science teachers from a conservative Christian school and three from a public school--were observed for 5 full days over a 3-week period. Information on the educational background of each teacher was also collected. Analysis of the data showed that the conservative Christian teachers held that all scientific knowledge must be in agreement with a literal interpretation of the Bible. The public school teachers presented an evolutionary view of origins, in contrast to the Christian school teachers' creationist views. Regarding classroom practice, both groups tended to teach science as a fixed, rather than developing field of knowledge, and both depended heavily on textbooks. (KR)

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A QUALITATIVE STUDY OF SECONDARY SCIENCE TEACHERS IN A PUBLIC SCHOOL AND A CONSERVATIVE CHRISTIAN SCHOOL

INTRODUCTION

Five Secondary science teachers in a public school and a Christian school were studied in terms of educational background, beliefs and classroom practices. This qualitative study incorporated classroom observations and taped interviews which were designed to reveal what each teacher believed about such matters as the nature of science and knowledge, the nature and purpose of education in general and science education in particular, and basic beliefs regarding God and purpose in life. Information on the educational background of each teacher was also collected.

This study is based on the proposition that what teachers believe to be fundamentally true - their world view - will have an influence on what is done in the classroom, and further, that teacher classroom behavior affects what students learn. This proposition is based in part on the Theory of Reasoned Action by Ajzen and Fishbein (1980), and it is also influenced by the concept of cognitive resources set forth by Ronald Giere (1988), which proposes that the training and experience of individual scientists, their "cognitive resources," are an important factor affecting their approach to scientific issues. Therefore, This paper

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proposes that the professional backgrounds and experiences of science teachers, their "cognitive resources," influence their approach to science teaching.

A common assumption of many educators is that science teachers' beliefs regarding the nature of science affects both science content and how science is presented in the classroom. This assumption is believed to be too restrictive, however. Instead, such study should be broadened to include three other target areas as well: a teacher's beliefs and attitudes regarding the teaching of science, and the more fundamental issue of the teacher's overall world view, his or her basic beliefs, and the impact of cognitive resources on teaching practice.

METHODOLOGY

This was a qualitative study that incorporated both classroom observations and taped interviews of five secondary science teachers: two from a private Christian school, and three from a public school. In addition, supplemental questionnaires served to focus the interviews and observations. The interviews were designed to have each teacher discuss what he believed about such matters as the nature of science, epistemology, reality, the nature and purpose of education in general, and science education in particular, and basic beliefs about God, the teacher's sense of purpose in life, and his concept of the nature of humanity. Information on the educational background of each teacher was also collected during these sessions and compared with the other

components of the study.

Each teacher was observed for five full days over a period of three weeks. Observations of each class targeted information about the classroom climate, teaching strategies employed, and the type, frequency and duration of teacher-student interactions. Observations of a variety of teaching techniques were made. In addition, teacher-student interactions during lectures, discussions and labs were recorded, and judgments of student freedom of expression were made.

RESULTS

To truly understand the Christian school teachers, one must understand their fundamentalist Christian world view. The world, for them, was created by God in six literal days, and is still under His guiding hand. The purpose of mankind, though subverted by sin to a large extent, is to serve and give glory to God. For these teachers, the Bible is also the inerrant Word of God and can be trusted as presenting truth in all that it covers. For science and science teaching, this means that all scientific knowledge and beliefs of modern society must be in agreement with the Bible in order to be accepted as correct. Anything of science that conflicts with the Bible is explained to students as incorrect or false. Furthermore, students are taught to evaluate all science claims according to how they conform to the Bible.

In general, the Christian school teachers work in an environment in which educational values are fairly well agreed upon

by all involved - the administration, teachers, parents and students - and because of this consensus they can freely teach dogmatic views as fact and truth. This context also provides a strong sense of purpose for them, that of doing God's will by serving Him as teachers in their school. They believe quite strongly that one of their major tasks as teachers is to help build Christian character and citizenship in their students.

The three public school teachers are not linked by a particular set of beliefs as are the Christian school teachers, but they do have some characteristics in common. None of the three would describe himself as a "born again" Christian, and all are evolutionists. None of these teachers believes the universe has any ultimate purpose, but they all believe humanity has a role as caretaker of the earth, a responsibility imposed by the possession of high intelligence and consciousness rather than by a divine being. Thus, their sense of responsibility toward the world is self-imposed. Whereas the Christian school teachers are primarily concerned with the spiritual conditions of humanity, these teachers have a broader set of concerns that focus more on physical and temporal issues of society and the environment.

All of the teachers shared a tendency to emphasize limited aspects of content over other possible components of science education. They focused on teaching for memorization and recall of data and other concrete information, yet in the interviews they spoke of the value of developing problem-solving skills and higher level thinking strategies.

When asked to rank the Project Synthesis goals (Harms and Yager, 1981), all placed academic preparation either first or second and career awareness last. While they all admitted that content dominated actual classroom practice, they also recognised that personal application and social issues were important and deserved more attention than they gave it. This discrepancy between belief and practice is thought to exist, in part, because these teachers depend upon textbooks to a great extent in their curriculum planning, and because of their perception that this is what is expected of them as science teachers. This suggests that the expediency of curriculum planning provided by science textbooks, and social norms play a large role in determining what these teachers actually do in their classrooms.

Another important point for science teaching is that, though these teachers view the nature of science in different ways, they present science as a fixed body of knowledge that has developed incrementally through history (the "Received View", Suppe, 1974). No evidence was found to indicate that students of these teachers are taught a view of science as a continually evolving endeavor. These findings accord well with Yager's work that found that most science teachers rely on textbooks up to 95% of the time, and that textbooks tend to present science as a fixed body of knowledge (Yager, 1983). It is possible that a teacher's continual contact with science through the science textbook, rather than through actual experience, may lead to an incorrect view of science as a fixed body of knowledge. This is supported by King (1991) who

found that science teachers entering the profession sometimes show knowledge of the social construction of science, whereas veteran teachers display an overwhelmingly positivistic and scientistic view of science, and he suggests that this difference may be due to influence from science textbooks, along with financial constraints and standardized achievement tests which emphasize fact-acquisition. Indeed, the scientific world of these teachers seems to consist of facts to be learned, whereas that of the scientist is different, involving a search for deeper and broader understanding of the natural world. The textbook focuses on that which is "known," accepted facts and other hard-content, while science itself is more oriented toward that which is yet to be understood.

The Christian school teachers demonstrated that beliefs act as an interpretative filters of science, especially regarding the issues of origins and organic evolution. These teachers make a deliberate attempt to teach a specific world view regarding science, whereas the public school teachers do not seem to try to teach a particular world view. From their perspective, they are are simply teaching science, although they present an evolutionary view of origins, in contrast to the creationist view presented by the Christian school teachers. Each of the five teachers stated that he gives students opportunity to express divergent views, yet each revealed that he has a clear leaning toward a particular view. For these five teachers, world view does have an effect on what they teach, especially with regard to the issue of origins.

A connection between professional background and teaching practice appears to exist for at least two of the teachers. One of the Christian school teachers had only one college science course, having majored in Greek and Bible, thus it could be said that his cognitive resources do not relate well to science teaching. His teaching practices seem to bear this out, for he displayed basically only one teaching strategy - a straight lecture supplemented by copious notes presented via overhead projector, and interpsersed with question-answer sessions. He almost never provided hands-on experiences for his students, and in fact, stated that he felt that labs were of little use in teaching science. The other teacher, from the public school, has been actively involved in Outward Bound for several years, and has a degree that focused heavily on environmental aspects of biology. This teacher provided the greatest amount of hands-on activities, and expressed the most concern about making science interesting for students. Whether such relationships between background and teaching behavior exist for science teachers in general cannot be answered by this study. However, these examples do suggest that teachers' cognitive resources can play a significant role in how they teach.

In summary, this study showed that, for these five teachers, world view and professional background do relate to teaching behavior.

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